

WHAT IS CLAIMED IS:

① An electromagnetic detector, comprising:

an insulating substrate;

a charge storage capacitor formed above said insulating substrate;

a charge collection electrode formed above said charge storage capacitor, said charge collection electrode being connected to said charge storage capacitor;

a semiconductor layer having electromagnetic conductivity, formed over said charge collection electrode; and

an uneven section formed in/on said charge collection electrode, dedicated for use in reinforcing a bonding strength between said semiconductor layer and said charge collection electrode, said uneven section being composed of at least a concave or convex part.

2. The electromagnetic detector as set forth in claim 1, further comprising:

an organic insulating layer formed under said charge collection electrode,

wherein said organic insulating layer has an uneven section formed in shape corresponding to said uneven section of said charge collection electrode.

10035442-010402

3. The electromagnetic detector as set forth in claim 1, wherein:

said charge collection electrode has a concave part to be functioned electrically.

4. The electromagnetic detector as set forth in claim 1, wherein:

said concave or convex part of said uneven section has a height or depth d from a surface of said charge collection electrode, satisfying the condition of:

$$0.3 \mu\text{m} \leq d \leq 10 \mu\text{m}.$$

5. The electromagnetic detector as set forth in claim 1, wherein:

said uneven section has a side face inclined at an angle in a range of 20 to 70° with respect to a surface of said charge collection electrode.

6. The electromagnetic detector as set forth in claim 1, wherein:

said uneven section covers not less than 10 percent of an area of said charge collection electrode.

7. The electromagnetic detector as set forth in claim 1, wherein:

201010-244500T 10035442-010402

said uneven section is formed in number per pixel of at least 5.

8. The electromagnetic detector as set forth in claim 1, wherein:

said uneven section is provided in plural number, and said plurality of uneven sections are arranged irregularly.

9. The electromagnetic detector as set forth in claim 1, wherein:

said semiconductor layer is made of a material including Se as a main component.

10. The electromagnetic detector as set forth in claim 1, wherein:

said semiconductor layer has a thickness in a range of 0.5 to 1.5 mm.

11. The electromagnetic detector as set forth in claim 1, wherein:

said charge collection electrode is composed of a conductive layer made of a material including Al as a main component.

10035442.010402

12. The electromagnetic detector as set forth in claim 1, further comprising:

a charge blocking layer formed between said charge collection electrode and said semiconductor layer.

13. An electromagnetic detector, comprising:

an active matrix substrate which includes an insulating substrate having formed thereon a charge storage capacitor, a plurality of electrode lines arranged in matrix form, an active element provided at each intersection between said electrode lines, an interlayer insulating layer formed over said electrode lines and said active element, and a charge collection electrode formed on said interlayer insulating layer, said charge collection electrode being connected to said charge storage capacitor;

a semiconductor layer having electromagnetic conductivity formed over said charge collection electrode on said active matrix substrate; and

an uneven section formed in/on said charge collection electrode, dedicated for use in reinforcing a bonding strength between said semiconductor layer and said charge collection electrode, said uneven section being composed of at least a concave or convex part.

10035442.010402

14. The electromagnetic detector as set forth in claim 13, wherein:

said charge collection electrode has a concave part to be functioned electrically.

15. The electromagnetic detector as set forth in claim 13, wherein:

said charge collection electrode has a connecting concave part, and said charge collection electrode is connected to said active element via said connecting concave part.

16. The electromagnetic detector as set forth in claim 13, wherein:

said interlayer insulating layer has an uneven section formed in shape corresponding to said uneven section of said charge collection electrode.

17. The electromagnetic detector as set forth in claim 13, wherein:

said interlayer insulating layer is made of an organic material.

18. The electromagnetic detector as set forth in claim 13, wherein:

10035442.010402

said charge collection electrode is formed on said interlayer insulating layer so as to cover said active element; and

said uneven section is formed so as not to be overlapped with said active element in a layered direction.

19. The electromagnetic detector as set forth in claim 13, wherein:

said concave or convex part of said uneven section has a height or depth d from a surface of said charge collection electrode, satisfying the condition of:

$$0.3 \mu\text{m} \leq d \leq 10 \mu\text{m}.$$

20. The electromagnetic detector as set forth in claim 13, wherein:

said uneven section has a side face inclined at an angle in a range of 20 to 70° with respect to a surface of said charge collection electrode.

21. The electromagnetic detector as set forth in claim 13, wherein:

said uneven section covers not less than 10 percent of an area of said charge collection electrode.

204070-2445001
10035442 010402

22. The electromagnetic detector as set forth in claim 13, wherein:

said uneven section is formed in number per pixel of at least 5.

23. The electromagnetic detector as set forth in claim 13, wherein:

said uneven section is provided in plural number, and said plurality of uneven sections are arranged irregularly.

24. The electromagnetic detector as set forth in claim 13, wherein:

said semiconductor layer is made of a material including Se as a main component.

25. The electromagnetic detector as set forth in claim 13, wherein:

said semiconductor layer has a thickness in a range of 0.5 to 1.5 mm.

26. The electromagnetic detector as set forth in claim 13, wherein:

said charge collection electrode is composed of a conductive layer including Al as a main component.

10035442-010402

27. The electromagnetic detector as set forth in claim 13, further comprising:

a charge blocking layer formed between said charge collection electrode and said semiconductor layer.

(28. An electromagnetic detector, comprising:

an active matrix substrate which includes an insulating substrate having formed thereon a charge storage capacitor; a plurality of electrode lines arranged in matrix form, an active element provided at each intersection between said electrode lines, an interlayer insulating layer formed over said electrode lines and said active element, and a charge collection electrode formed on said interlayer insulating layer, said charge collection electrode being connected to said charge storage capacitor;

a semiconductor layer having electromagnetic conductivity formed over said charge collection electrode on said active matrix substrate; and

an uneven section formed in/on said charge collection electrode in an area not in contact with said active element and said charge storage capacitor, said uneven section being composed of at least a concave or convex part.

10035442.010402

29. The electromagnetic detector as set forth in claim 28, wherein:

said charge collection electrode has a concave part to be functioned electrically.

30. The electromagnetic detector as set forth in claim 28, wherein:

said charge collection electrode has a connecting concave part, and said charge collection electrode is connected to said active element via said connecting concave part.

31. The electromagnetic detector as set forth in claim 28, wherein:

said interlayer insulating layer has an uneven section formed in shape corresponding to said uneven section of said charge collection electrode.

32. The electromagnetic detector as set forth in claim 28, wherein:

said interlayer insulating layer is made of an organic material.

33. The electromagnetic detector as set forth in claim 28, wherein:

10035442-010402

said charge collection electrode is formed on said interlayer insulating layer so as to cover said active element; and

said uneven section is formed so as not to be overlapped with said active element in a layered direction.

34. The electromagnetic detector as set forth in claim 28, wherein:

said concave or convex part of said uneven section has a height or depth d from a surface of said charge collection electrode, satisfying the condition of:

$$0.3 \mu\text{m} \leq d \leq 10 \mu\text{m}.$$

35. The electromagnetic detector as set forth in claim 28, wherein:

said uneven section has a side face inclined at an angle in a range of 20 to 70° with respect to a surface of said charge collection electrode.

36. The electromagnetic detector as set forth in claim 28, wherein:

said uneven section covers not less than 10 percent of an area of said charge collection electrode.

10035442.010402

37. The electromagnetic detector as set forth in claim 28, wherein:

said uneven section is formed in number per pixel of at least 5.

38. The electromagnetic detector as set forth in claim 28, wherein:

said uneven section is provided in plural number, and said plurality of uneven sections are arranged irregularly.

39. The electromagnetic detector as set forth in claim 28, wherein:

said semiconductor layer is made of a material including Se as a main component.

40. The electromagnetic detector as set forth in claim 28, wherein:

said semiconductor layer has a thickness in a range of 0.5 to 1.5 mm.

41. The electromagnetic detector as set forth in claim 28, wherein:

said charge collection electrode is composed of a conductive layer made of a material including Al as a

204070-2445E001

main component.

42. The electromagnetic detector as set forth in claim 28, further comprising:

a charge blocking layer formed between said charge collection electrode and said semiconductor layer.

43. An active matrix substrate, comprising:

an insulating substrate having formed thereon a plurality of electrode lines arranged in matrix form, an active element provided at each intersection between said electrode lines, an interlayer insulating layer formed over said electrode lines and said active element, and a plurality of pixel electrodes formed on said interlayer insulating layer,

wherein said interlayer insulating layer is formed so as to cover a pixel array region in which said electrode lines are arranged in matrix form and at least partially cover a marginal region surrounding said pixel array region; and

an uneven section is provided in/on at least a part of an upper surface of said interlayer insulating layer formed on said marginal region, said uneven section being composed of at least a concave or convex part.

10035442.010402

44. The active matrix substrate as set forth in claim 43, wherein:

said interlayer insulating layer is made of a photosensitive organic material.

45. The active matrix substrate as set forth in claim 43, wherein:

a surface of said uneven section is covered with an inorganic material.

46. The active matrix substrate as set forth in claim 45, wherein:

said inorganic layer is made of a same material as said pixel electrodes.

47. The active matrix substrate as set forth in claim 45, wherein:

said uneven section is formed so as to go through said interlayer insulating layer in an area in contact with said insulating substrate; and

a surface of said uneven section is covered with an inorganic layer.

48. The active matrix substrate as set forth in claim 43, wherein:

10035442.010402

said uneven section is formed so as not to be overlapped with said electrode lines in a layered direction of said interlayer insulating layer with respect to said electrode lines.

49. The active matrix substrate as set forth in claim 43, wherein:

said uneven section is composed of a concave part.

50. An electromagnetic detector, comprising an active matrix substrate, which includes:

an insulating substrate having formed thereon a plurality of electrode lines arranged in matrix form, an active element provided at each intersection between said electrode lines, an interlayer insulating layer formed over said electrode lines and said active element, and a plurality of pixel electrodes formed on said interlayer insulating layer,

wherein said interlayer insulating layer is formed so as to cover a pixel array region in which said electrode lines are arranged in matrix form and at least partially cover a marginal region surrounding said pixel array region; and

an uneven section is provided in/on at least a part of an upper surface of said interlayer insulating layer

10035442-010402

formed on said marginal region, said uneven section being composed of at least a concave or convex part, said electromagnetic detector, further comprising:

a semiconductor layer having electromagnetic conductivity, formed so as to cover said pixel array region and at least partially cover said marginal region of said active matrix substrate, said semiconductor layer being formed over said uneven section on said marginal region.

51. The electromagnetic detector as set forth in claim 50, wherein:

said semiconductor layer is arranged such that a portion above said uneven section is made gradually thinner towards an outer circumference of said active matrix substrate.

52. A liquid crystal display device, comprising:

an active matrix substrate which includes an insulating substrate having formed thereon a plurality of electrode lines arranged in matrix form, an active element provided at each intersection between said electrode lines, an interlayer insulating layer formed over said electrode lines and said active element, and a plurality of pixel electrodes formed on said

1005442-010402

interlayer insulating layer,

wherein said interlayer insulating layer is formed so as to cover a pixel array region in which said electrode lines are arranged in matrix form and at least partially cover a marginal region surrounding said pixel array region; and

an uneven section is provided in/on at least a part of an upper surface of said interlayer insulating layer formed on said marginal region, said uneven section being composed of at least a concave or convex part, said liquid crystal display device, further comprising:

a seal member formed on said uneven section, for sealing a liquid crystal layer on said marginal region of said active matrix substrate.

53. An electromagnetic detector, comprising:

an active matrix substrate provided with a pixel array region where a plurality of electrode lines are arranged in matrix form, and an active element is provided at each intersection between said electrode lines, and a marginal region surrounding said pixel array region; and

a semiconductor layer having electromagnetic conductivity formed over a surface of said active matrix substrate so as to cover said pixel array region and at

10035442-010402

least partially cover said marginal region,

wherein an uneven section is provided in/on at least a part of a surface of said marginal region facing said semiconductor layer, said uneven section being composed of at least a concave or convex part.

54. The electromagnetic detector as set forth in claim 53, wherein:

a surface of said uneven section is covered with an inorganic layer.

55. An electromagnetic detector, comprising:

an insulating substrate, whereon a plurality of electrode lines arranged in matrix form, and an active element provided at each intersection between said electrode lines, an interlayer insulating layer, a plurality of pixel electrodes, and a semiconductor layer having electromagnetic conductivity are laminated in this order,

wherein an uneven section is provided in/on at least a part of a surface of said interlayer insulating layer facing said semiconductor layer, said uneven section being composed of at least a concave or convex part.

10035442-010402

56. The electromagnetic detector as set forth in claim 55, wherein:

a surface of said uneven section is covered with an inorganic layer.

57. The electromagnetic detector as set forth in claim 55, wherein:

a surface of said uneven sections is covered with an inorganic layer made of a same material as said pixel electrodes.

58. The electromagnetic detector as set forth in claim 55, wherein:

said uneven section is formed so as to go through said interlayer insulating layer in an area in contact with said insulating substrate; and

an inorganic layer is formed on said uneven section between said interlayer insulating layer and said insulating substrate, said inorganic layer having a higher bonding strength with respect to said semiconductor layer than that of a surface of said insulating substrate.

10035442.010402